Aalto University
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Bachelor's Thesis

Stock market reactions to Covid-19 and ECB stimulus plans in Europe

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Abstract

In this thesis, I study the stock market reactions, that three pieces of Covid-19 related bad news and, three positive announcements of European Central Bank (ECB) stimulus had on European markets. Using event study methodology, the findings of this study suggest, that the World Health Organisation's classification of Covid-19 as a pandemic caused a severe shock to the stock market returns across market capitalizations and industries. In this event, small and medium-sized companies' stocks suffered the most while large-cap enterprises' stock prices experienced positive cumulative abnormal returns. The ECB's announcements of the Pandemic Emergency Purchase Programme (PEPP) seemed to have given the markets the needed relief. The first and third PEPP announcements appeared to be the most effective. Medium-, and especially small-sized companies' stocks accumulated positive abnormal returns from the announcements while large companies' stocks seemed to lack significant reactions.

Keywords: Covid-19, Europe, Event Study, Abnormal returns, Stock Markets

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1. Introduction

2020 was a year like no other in recent human history. A pandemic created by the novel coronavirus 2019-nCoV, commonly known as Covid-19 shook countries and stock markets around the globe. The spread of the virus originated from the city of Wuhan in the Hubei province of China in December 2019. The first case outside of China was reported on January 13th, 2020, after that the virus quickly spread across the world. Only a few weeks later on January 30th, the World Health Organization (WHO) declared Covid-19 as a Public Health Emergency of International Concern (PHEIC). Different countries and territories around the globe planned harsh measures to counter the intensifying situation. On March 11th the WHO announced that the epidemic caused by the spread of Codiv-19 should be classified as a pandemic. (WHO, 2020)

Whole cities got placed under quarantine and curfews affected the everyday life of millions of people around the world. Facemasks, travel restrictions, social distancing, and working from home became the new normal. The crisis rapidly spread to the economy as businesses faced both demand and supply-side problems due to the lockdowns. This led to falling of World Gross Domestic Product. The World Bank estimated a 3,5% loss in both world and Euro area GDP in 2020. (World Bank, 2021)

As a response to the worsening situation, central banks quickly had their stimulus plans ready. The Federal Reserve Bank in the United States and the European Central Bank in the EU both launched some of the biggest programs to date. On March 18th, 2020 the ECB made the first announcement of the Pandemic Emergency Purchase Programme (PEPP) with an overall envelope of €750 billion. The PEPP aimed to ease the economic crisis and smoothen the markets. At first, the purchases completed through the program were intended to continue at least until the end of 2020. However, more announcements followed. On June 4th the ECB announced that it will increase the PEPP by €600 billion and expand its horizon, and on December 10th the envelope was further increased by €500 billion to a total of €1850 billion.

Events like the Covid-19 pandemic and the related stimulus announcements create an unique platform for event study. I get to examine the market reactions to exogenous shocks that affect the whole of economy at once. This allows me to see how companies of different sizes and industries react to the same news. For the mentioned reasons, I believe this study will to provide interesting results.

In this study, I will examine the stock market reactions caused by the three bad news from the beginning of the Covid-19 pandemic timeline and the reactions caused by the three ECB PEPP announcements. The study will be conducted using the event study methodology following (Brown & Warner, 1985) and (MacKinlay, 1997). My findings suggest that the first two bad events caused quite moderate reactions. The majority of the industry indices experienced short-lived negative CAR following the band news. WHO pandemic announcement caused the European stock markets to generate negative abnormal returns across market capitalizations and industries. Especially small and medium-sized enterprises (SME) took big hits, Large companies on the other hand seem to have generated positive CAR after the announcement. ECB stimulus announcements calmed the markets, this reaction is most noticeable following the first of the three PEPP statements. The second didn't seem to affect the markets by a lot and the third one gave a boost especially to SMEs. Large companies did not seem to react strongly to these PEPP dates. Industries like Health Care, Industrials, Utilities and Financials reacted positively during the first and third PEPP dates.

2. Background

2.1. Beginning of Covid-19 in Europe

The first cases of the novel 2019-nCoV (COVID-19) hit Europe on January 24th when France announced that it had confirmed three cases. All three were tourists who had travelled to France from the origins of Covid-19, Wuhan City in China (WHO Europe, 2020). More cases around Europe started emerging now and then. The first cluster of cases occurred in late February in Italy, where 11 towns in Lombardy, Northern Italy were placed under quarantine on February 21st after multiple cases and a few Covid-19 related deaths occurred in the region (BBC, 2020). Soon after, due to the widely increased spread of Covid-19 cases, on March 9th the Italian Prime Minister Giuseppe Conte announced nationwide quarantine (The Wall Street Journal, 2020). Following the rising number of new cases across Europe (Chart 1), other countries also gave strict restrictions for their citizens to stop the virus from spreading.

On the 11th of March 2020, WHO announced that it now classifies the outbreak caused by 2019-nCoV as a pandemic. Only two days later on March 13th, WHO Director-General classified Europe as the

epicentre of the pandemic (WHO, 2020). Chart 1 shows the number of new daily cases in Europe. Travel restrictions took place to restrict the virus, both inside the Schengen free-travel zone and to its external borders. The EU closed its external borders from all non-essential travel on March 17th (European Council, 2020).

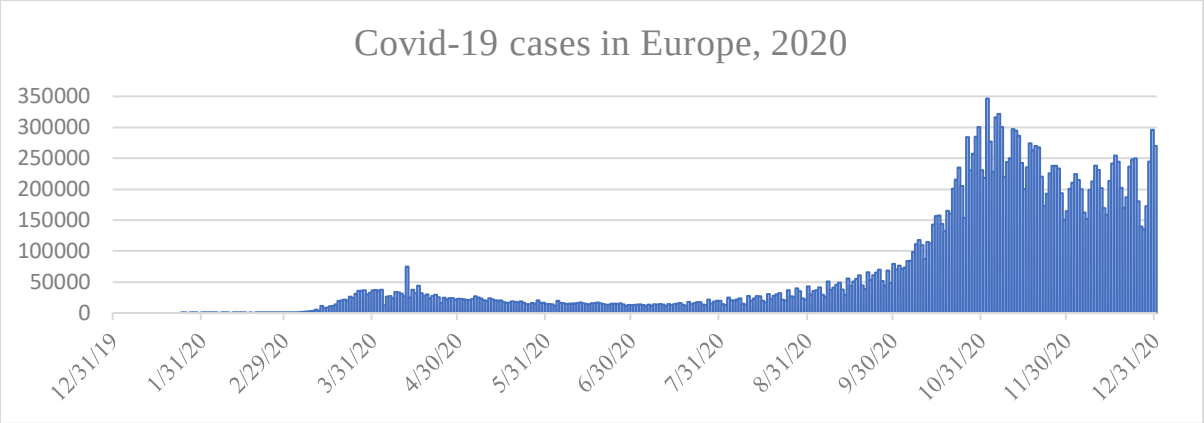


Chart 1: Daily new cases of Covid-19 in Europe Note: This chart shows the daily number of new, confirmed Covid-19 cases in Europe during the year 2020 (blue columns). First cases appear during January 2020 and numbers rice in March. A second and much higher wave of cases begins during September. Source: Our World in Data.

2.2. The stock market reaction in Europe

The lockdowns around Europe created both demand and supply-side crises for European companies. Together with the spread of Covid-19 around Europe, the announcement of pandemic classification, and all other restrictions, the crisis had a huge impact on the economy. All these bad news shook the stock markets harshly. Stocks around the world plummeted on March 12th following the WHO announcement on the previous day. In London the FTSE 100 had its worst days since 1987 (BBC, 2020). The market index chosen for this study, MSCI AC Europe IMI, had a return of –13%. From the beginning of February to the end of March, the AC Europe IMI index went down roughly 25% with a low of –41% on March 23rd. (Chart 2). After this, the market conditions changed many times, and reactions varied with a great multitude of ups and downs. One major thing affecting the markets might have been the ECB's Pandemic Emergency Purchase Programme.

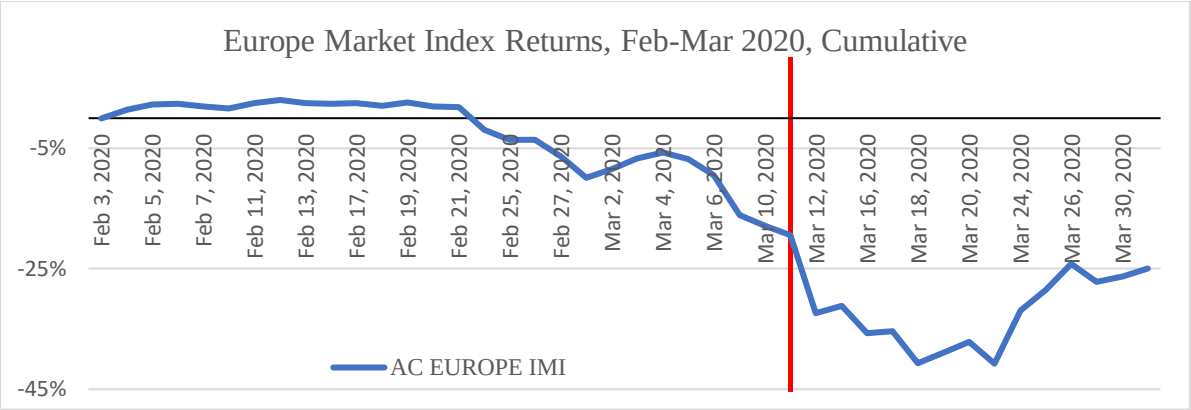


Chart 2: MSCI AC EUROPE IMI cumulative daily returns, February – March 2020. Note: This chart shows cumulative daily returns of the MSCI AC EUROPE IMI index (blue line). The Red line represents the WHO pandemic announcement of COVID-19. The returns of the index declined during the end of February, the WHO pandemic announcement further inflates the fall.

2.3. ECB Pandemic Emergency Purchase Programme

To counter the impact of Codiv-19, the worsening economic situation, and falling stock markets in Europe, the European Central Bank (ECB) launched its largest stimulus package to date. On March 18th, 2020 the Governing Council of ECB announced that the ECB is launching a new temporary asset purchase program called Pandemic Emergency Purchase Programme (PEPP). PEPP is targeted for purchasing financial assets such as corporate and government bonds from both public and private sectors. PEPP is going to be working in addition to the existing and ongoing asset purchase program (APP). They have the same asset categories eligible for purchase, PEPP with some additions like securities issued by the Greek Government. At first, the PEPP had a total envelope of €750 billion and plans to be continued until the end of the pandemic, not to be stopped in any case before the end of 2020 (ECB, 2020).

After the initial announcement, the PEPP envelope was enlarged two times. First on June 4th, 2020 with an additional €600 billion and finally on December 10th with an additional €500 billion to a total envelope of €1.85 trillion. In the press on June 4th, the ECB stated that the envelope increase is done: "*In response to the pandemic-related downward revision to inflation over the projection horizon, the PEPP expansion will further ease the general monetary policy stance, supporting funding conditions in the real economy, especially for businesses and households."* On top of envelope increases, the timeline of the PEPP has been expanded to continue at least to March 2022. The ECB has stated that if necessary it might again change the total amount to be spent on asset purchases under the PEPP envelope (ECB, 2020).

Underlying economic mechanism and reactions

The PEPP is a program of quantitative easing and works by purchasing different financial assets, mostly government and corporate bonds, thereby encouraging investments, funding, and lending in the economy. PEPP has a dual role in the Euro area. (ECB, 2020). First, together with other ECB policies, the PEPP purchases are the primary tool for keeping down interest rates, which is required to enable economic upturn and maintain medium term price stability. Secondly, the PEPP's flexibility in its asset purchases, across asset categories, time, and jurisdictions is critical to allow the ECB to balance the financial markets efficiently and effectively. When ECB makes purchases via PEPP, it aims to lower financing conditions for firms and governments. This is achieved by providing more money to the lending markets which helps to keep the interest rates down. Furthermore, the ECB monetary policy announcements have a signalling effect, reducing volatility and uncertainty in the markets.

Immediately after the first PEPP announcement yields of 10-year government bonds across countries with high public debt. The yield on the Italian 10-year government bond dropped as much as 80 basis points. (Financial Times, 2020). A study by (Moessner & de Haan, 2021) found out that that the term premia in 10-year government bonds decreased in higher sovereign risk countries after the announcement of the PEPP. Previously in similar situations, the results have been a positive shock to the stock markets. (Chebbi, 2019) shows that ECB's unconventional monetary policies that have decreased the sovereign spread and cut government bond yields have led to higher stock returns.

By flattening yield curve, the PEPP has extracted the duration risk from investors with its purchases and therefore strengthened the impacts of ECB's negative interest rate policy (ECB, 2020). Moreover, after the PEPP announcements, the issuance of corporate bonds by investment grade-rated firms and commercial paper by non-financial corporations increased noticeably. This highlights the importance

of PEPP's flexibility: including longer maturity private sector purchases. The market for non-financial commercial papers would have been at the risk of freezing up, due to PEPP market-based funding conditions for private European companies have been eased (ECB, 2020).

As it can be seen from Chart 3, the European stock markets have been slowly gaining back what they lost at the beginning of the pandemic. In this study I will further examine what kind of reactions did the different ECB PEPP announcements create, and how exactly did they move the markets.

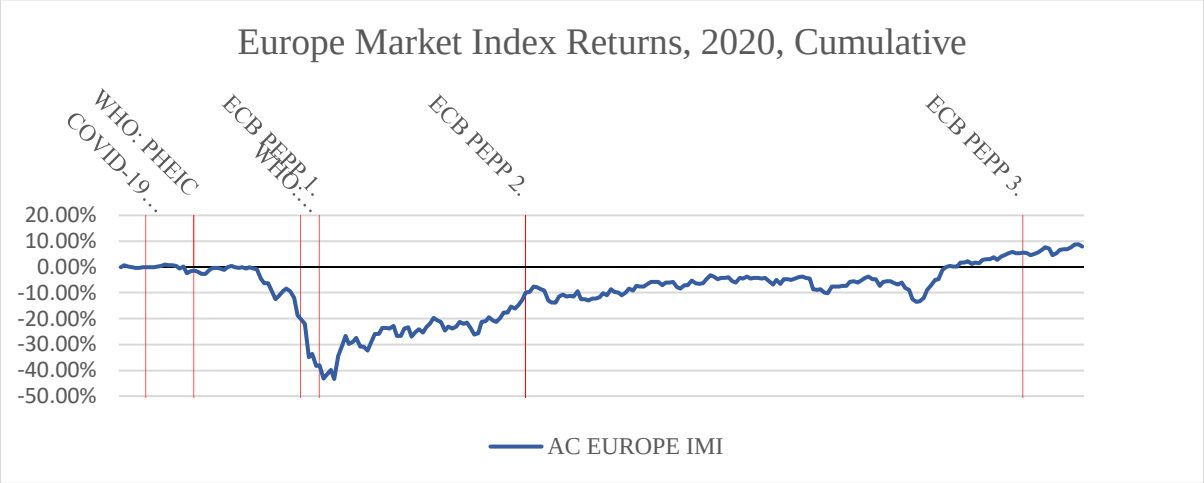


Chart 3: MSCI AC Europe IMI cumulative returns and event dates, 2020. Note: This chart shows the cumulative returns of the MSCI AC EUROPE IMI index (blue line) during the year 2020. Red lines in the chart represent each event date, Covid19 outside china, WHO: PHEIC, WHO: Pandemic, ECB PEPP I, II, and III announcements. The cumulative return of the index falls sharply during the WHO pandemic announcement and slowly recovers.

3. Literature review

The Covid-19 pandemic has been a huge part of our daily lives since the beginning of 2020. As it has affected people, the economic situation, and the stock markets across the globe, quite a few studies on the topic have been emerging recently. The academic world has studied the effects of the pandemic both on an international level and by county or area-specific event studies. The pandemic caused by the Covid-19 has been shown to generate a downward trend in the stock markets and cause significant negative returns (Bash, 2020), (Singh et al., 2020), (Al-Awadhi et al., 2020), (Hong et al., 2021), (Zhang et al., 2020). I have no doubt that this will also be seen in my study. In addition to market crash, the pandemic has also made the stock market highly volatile and unpredictable (Zhang et al., 2020).

(Baker, Bloom, et al., 2020) suggested that government restrictions on commercial activity and people's willingness to practise social distancing in a service-oriented economy caused the U.S. stock markets to react so much harsher to this pandemic than previous ones in history. Related, (Baker, Farrokhnia, et al., 2020) noticed how the pandemic seriously affected people's spending, with the strongest decrease in U.S. states where shelter-in-place orders were in place. Even if these studies were conducted by U.S. data I believe that due to Europe's similarities to the U.S. way of life cause the results to be noteworthy for my study.

Relevant to my thesis is also a study by (Gormsen & Koijen, 2020) that forecasted the impact of the pandemic on stock prices and their growth expectations. Gromsen & Koijonen found out that the

European Union is likely to experience a more vicious hit compared to the United States and Japan, measured by the growth of dividends and GDP. (Ramelli & Wagner, 2020) suggested that international companies with trade to China underperformed during the beginning of the pandemic. As the virus hit Europe and the U.S., the stocks in these areas got hit. Their findings show that the real economic effects of the pandemic were anticipated to be amplified by the markets. (Albuquerque et al., 2020) discovered that stocks with higher environmental and social policy ratings have gained significantly higher returns during the time of the pandemic. (Yan, 2020) studies the Chinese stock market reactions at the beginning of the pandemic from the end of January 2020 to the beginning of April 2020 and concludes that large firms benefit from monopoly-like power and are more resilient in the hands of the pandemic. This study is from Chinese markets, were conditions differ from Europe. While I believe that large companies will be less volatile compared to SEMs, the reasons behind the results might be different.

A study by (Liew, 2021) examined the early stages of the pandemic and the impact of Wuhan lockdown in the Chinese stock market. The study reports empirical evidence on significant negative returns across all component sectors of the Shanghai Stock Exchange Composite. Additionally, the study found out that industries that helped to tackle the pandemic like healthcare and technology were outperforming the market. This is particularly interesting, but again as the study is from Chinese markets, these results might not be applicable in Europe. I still wish to see similar results with my study.

Studies about monetary policies effects to counter the pandemic have found out that the monetary policy decisions and stimulus packages launched by central banks can have had varying results. (Harjoto et al., 2021) found out that the Federal Reserve Bank stimulus announcement caused positive abnormal returns in the US. This can be seen especially with large firms, not so much with small ones. Also, the unlimited QE in the U.S. might create even further uncertainty and cause long-term problems, even if short-term results are beneficial to the stock markets. (Zhang et al., 2020) (Gormsen & Koijen, 2020). (Moessner & de Haan, 2021) studied the European Central Bank's Pandemic Emergency Purchase Programme (PEPP) effects on 10-year government bond yields in the euro area. Controlling for other ECB statements, they found out that the term premia in countries with higher sovereign risk decreased more after the announcement of the PEPP. This results might suggest that the stock market reaction from the announcements in my study will be positive. (Chebbi, 2019) studied the stock market reactions to previous ECB stimulus announcements and found out that those ECB's unconventional monetary policies that have led to decreased sovereign spread and decrease in government bond yields have also led to higher stock returns. It is noticeable, that these results derive from previous ECB monetary policy announcements, not the PEPP announcements under examination at this study.

This paper contributes to the literature mentioned above by exanimating how both shocking news, like the WHO announcement of pandemic classification and central bank stimulus packages, have affected the European stock markets. Most of the studies I mentioned only studied the effects of Codiv-19 and different stimulus packages in territories outside of Europe. The ones including Europe do not handle the reactions that stock markets have had on the ECB PEPP stimulus plans. To the best of my knowledge, no other studies have been published to date that focus on the European stock market reactions to ECB PEPP announcements. This paper provides empirical research and results on the performance of both differently sized corporations and different industries during pandemic and stimulus event dates.

4. Research questions and hypotheses

Along the lines of discussion at the end of the literature review, this thesis is going to focus on the reactions that the European stock markets have had on to the big news related to Covid-19 and ECB's PEPP announcements. Due to the pandemic still actively spreading across the world as new variants and clusters of cases appear, it is too early to assess the full and long-term impacts of this crisis. This thesis will study the market's short-term reactions. I will examine these reactions using three bad news dates from the beginning of the pandemic and three good news dates, the ECB PEPP announcements. Further details on the events are discussed in the Event Dates segment of this thesis. My study will examine the reactions of three indices of the European stock markets with different sized enterprises measured by capitalization and eight industry indices in the European markets. Further details on the indices are also discussed in the Indices segment.

I hypothesize that the bad news have generated significant negative abnormal returns in all of the size indices. I believe this to be true especially on the trading day (March 12) following the third bad news date (March 11), the WHO announcement of Covid-19 as a pandemic (WHO, 2020). Following this event, all the indices are likely to display deep dive and seriously negative abnormal returns. I believe my findings will be similar to those made by (Harjoto et al., 2021) when studying shock and stimulus reactions to U.S. markets and (Yan, 2020) when studying the reaction of Chinese stock markets to Covid-19. This meaning, that especially smaller and medium-sized firms will take a big hit following the bad news, and larger firms reacting more steadily.

I believe that all industry indices will also have significant negative returns following the bad news dates. Although industries that are closely related to the pandemic, like information technology and health care, might take a bigger hit than others. I also believe that this effect can be seen when looking at Consumer Staples and Consumer Discretionary, where the Consumer Discretionary is likely to react much more furiously. On top of Consumer Discretionary, I believe that other also cyclical industries like Industrials and Utilities will display great negative returns following the bad news.

When it comes to the good news dates, the ECB PEPP announcements, I believe that reactions will not be as strong as with the negative news dates, but still calming or even positive to the markets. I hypothesize that the clearest reactions will happen following the first announcement date as it happened only seven days after (March 18th) the WHO Pandemic classification. Even if the PEPP announcement had shifted the direction of the markets, all of the indices might still be generating significantly negative abnormal returns due to the pandemic. Later, on the second and third PEPP announcement dates, I believe that the returns from examined indices will be mostly positive, possibly displaying some positive abnormal returns. I suppose that especially the cyclical industries mentioned at the end of the previous chapter will react positively to the PEPP announcements.

(Harjoto et al., 2021) found out that especially large firms have benefitted from FED's stimulus in the U.S. markets, so this might be something that can be visible also in the European stock market indices. On the other hand, it is possible that small and medium-sized enterprises (SME), that usually display more volatile returns, might be the ones benefitting the most from stimulus plans, as I believe they also take the deepest dive during the bad news. (Liew, 2021) noticed that industries that are helping to tackle the pandemic, like health care and technology, were outperforming in the Chinese market during the beginning of the pandemic. This might be seen also in Europe, I believe that health care and information

technology industry indices will be having strong, significantly positive abnormal returns following the PEPP announcements.

Generally my hypothesis contain rather reasonable expectations based on previous studies. Bad news and particularly the pandemic announcement resulting in big negative abnormal returns and ECB stimulus helping the situation. SMEs are likely to be more impulsive during the events compared to large companies. Cyclical industries and the ones related to the situation will act feverishly.

5. *Data and methodology*

5.1. Data

To find out what kind of reactions European stock markets have had resulting from the Covid-19 and ECB PEPP news, I have gathered indices for both differently sized companies and companies from different sectors. Altogether I am using twelve different indices. The indices I am using for the study are all from Morgan Stanley Capital International (MSCI). As a market benchmark for the European markets I use MSCI AC EUROPE IMI index. It covers large, mid, and small-sized companies and includes constituents from both developed (DM) and emerging (EM) European countries.

For large-, medium-, and small-cap indices I use MSCI AC EUROPE LARGE CAP, MSCI AC EUROPE MID CAP and, MSCI AC EUROPE SMALL CAP. They all contain constituents from developed and emerging European countries.

For industry-level data, I gathered eight industry indices from MSCI. Communication Services, Financials, Industrials, Health Care, Information Technology, Utilities, Consumer Discretionary and, Consumer Staples. All companies in the indices have been classified to their sectors by Global Industry Classification Standard (GICS®). Information about the chosen indices is displayed in Table 1 and Table 2.

Table 1 *Indices summary statistics*

Variable	Observations	Minimum	Maximum	Mean	Median	Standard deviation of returns
EUROPE IMI	645	553,46	1031,98	819,51	804,63	1,30 %
LARGE	645	523,43	928,30	755,28	752,06	1,30 %
MID	645	574,07	1163,23	887,67	857,29	1,36 %
SMALL	645	734,18	1629,41	1192,71	1141,93	1,36 %
TeleCom	645	38,51	60,89	53,01	54,36	1,21 %
Finance	645	37,50	67,53	55,49	58,32	1,72 %
Industrial	645	164,94	324,06	253,58	247,75	1,50 %
Health	645	171,46	238,06	208,67	212,48	1,08 %
InfoTech	645	103,26	235,19	162,10	154,39	1,69 %
Utilities	645	99,32	148,26	123,07	122,71	1,30 %
ConsDisc	645	106,48	229,22	167,85	163,66	1,54 %
ConsStap	645	219,36	293,75	265,66	264,97	0,98 %

Table 1: Indices summary statistics. Note: This table shows summary statistics for the chosen indices. All indices contain daily observations for 645 days starting from January 1st, 2019 reaching to 21st of June 2021. The standard deviation of returns shows that returns of industries like Finance, Industrial, and InfoTech are the most volatile. MID and SMALL are also a bit more volatile compared to LARGE or the market index, IMI.

Table 2 *Information about chosen indices*

Index	Full Name	About
EUROPE IMI	MSCI AC Europe IMI	AC Europe IMI is the chosen market benchmark index. It holds constituents from 15 DM and 6 EM European countries.
LARGE	MSCI AC Europe LARGE CAP	LARGE is an index representing large-cap European companies. It holds constituents from 15 DM and 6 EM European countries.
MID	MSCI AC Europe MID CAP	MID is an index representing mid-cap European companies. It holds constituents from 15 DM and 6 EM European countries.
SMALL	MSCI AC Europe SMALL CAP	SMALL is an index representing small-cap European companies. With 1127 constituents from 15 DM and 6 EM European countries, the index covers approximately 14% of the free float-adjusted market capitalization across each country.
CommSer	MSCI EUROPE Communication Services Index	CommSer is an index for European companies in the field of telecommunications. The Index consists of 32 constituents from 15 DM countries in Europe. The largest company in the index is DEUTSCHE TELEKOM
Finance	MSCI Europe Financials Index	Finance is an index for European companies in the field of financial services. The Index consists of 79 constituents from 15 DM countries in Europe. The largest company in the index is HSBC HOLDINGS (GB)
Industrial	MSCI Europe Industrials Index	Industrial is an index for European companies in the industrial sector. The Index consists of 52 constituents from 15 DM countries in Europe. The largest company in the index is LVMH MOET
Health	MSCI Europe Health Care Index	Health is an index for European companies in the field of Health Care. The Index consists of 40 constituents, 73% of which are considered Pharmaceuticals. Constituents are from 15 DM countries in Europe. The largest company in the index is ROCHE HOLDING GENUSS
InfoTech	MSCI Europe Information Technology Index	InfoTech is an index for European companies in the Information Technology sector. The Index consists of 25 constituents from 15 DM countries in Europe. The largest company in the index is ASML HLDG
Utilities	MSCI Europe Utilities Index	Utilities is an index for European companies in the Utility sector. The Index consists of 25 constituents from 15 DM countries in Europe. The largest company in the index is ENEL
ConsDisc	MSCI Europe Consumer Discretionary Index	ConsDisc is an index for European companies in the field of non-essential consumer goods. The Index consists of 52 constituents from 15 DM countries in Europe. The largest company in the index is LVMH MOET HENNESSY
ConsStap	MSCI Europe Consumer Staples Index	ConsStap is an index for European companies in the field of consumer essentials. The Index consists of 39 constituents from 15 DM countries in Europe. The largest company in the index is NESTLE

Table 2: Information about chosen indices. Note: This table shows general information about the chosen indices. DM means developed markets, which include: Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the UK. EM means emerging markets, which include: Czech Republic, Greece, Hungary, Poland, Russia, and Turkey. Information about indices from MSCI indices.

The stock index data provided by MSCI indices are robust. MSCI has an accuracy 99.6% with their index production. MSCI indices also have 14,5 USD trillion of benchmarked assets under management and on top of this, MSCI indices create the base for over 1300 exchange-traded funds. (MSCI 2021)

Event dates

As previously mentioned I have decided six different events for this study to find out what kind of reactions the European stock markets had. As Covid 19-realted events, I use three dates with significant bad news about the development of the Covid-19 situation around the world, the dates range from January to March 2020. For the stimulus events, all three are ECB PEPP announcement dates, they range from March to December 2020.

Bad news dates:

I. January 13th, 2020: Officials confirm a case of COVID-19 in Thailand, the first recorded case outside of China.
II. January 30th: World Health Organization declares Covid-19 as a Public Health Emergency of International Concern (PHEIC)
III. March 11th: World Health Organization declares Covid-19 as a pandemic

Stimulus dates:

I. March 18th: ECB Pandemic Emergency Purchase Programme, the first announcement
II. June 4th: ECB Pandemic Emergency Purchase Programme, the second announcement
III. December 10th: ECB Pandemic Emergency Purchase Programme, the third announcement

5.2. Methodology

Event Study Methodology

For the empirical part of this study, I use the event study methodology. When assessing the impacts of an event on indices returns during an event, the event study methodology is widely thought to be to be among the most appropriate methods. Many other researchers have used it to study the stock market impacts of COVID-19 and such similar to the outbreak. (Harjoto et al., 2021; Liew, 2020, 2021; Pendell & Cho, 2013; Singh et al., 2020) As the goal of this study is to uncover how the European stock markets have reacted around the time of the selected COVID-19 news dates, the event study methodology is an obvious fit.

Furthermore, previous research like studies conducted by (Brown & Warner, 1985) and (MacKinlay, 1997) have suggested the event study methodology to be the most useful way when estimating abnormal returns (ARs) related to an announcement or an event.

To examine the market reactions caused by the different news, I calculate cumulative abnormal returns (CAR). When calculating CAR, I use ordinary least squares estimation (OLS) market model returns following the event study methodology by (Brown & Warner, 1985). To ensure that all the estimators are the best possible fit for each event, I use 240 trading days before the event windows (Graph 1) as an estimation period to calculate the OLS values. Overall the data periods used span from 28th of January 2019 to 24th of December 2020, covering almost two years.

Estimation Model

To begin the event study I calculate the daily returns from the indices with the following equation (1):

$$R_{i,t} = \ln\left[\frac{P_{i,t}}{P_{i,t-1}}\right] \times 100 \quad (1)$$

Equation 1. Note: $R_{i,t}$ is the return for the day t of index i, ln is the natural logarithm. $P_{i,t}$ equals the closing price of index i on the day t and, $P_{i,t-1}$ is the closing price for the index i on the previous trading day.

The OLS statistics, $\hat{\alpha}$ and $\hat{\beta}$ are acquired when regressing the returns of index i and the chosen market index MSCI AC EUROPE IMI over the estimation window of each event. (Graph 1)

Abnormal returns AR are calculated with the following equation (2):

$$AR_{i,t} = R_{i,t} - (\hat{\alpha}_i + \hat{\beta}_i R_{m,t}) \quad (2)$$

Equation 2. Note: $AR_{i,t}$ is the abnormal return for the day t of index i. $\hat{\alpha}_i$ and $\hat{\beta}_i$ are OLS values from the estimation period of each event of index i. $R_{m,t}$ is the return for the day *t* of the market index and, $R_{i,t}$ is the return for the day *t* of index i.

Cumulative abnormal returns are calculated as a sum of the OLS market model returns for the event periods with the equation (3):

$$CAR_i[t_0, t_{,1}] = \sum_{t=t_0}^{t_1} AR_{i,t} \quad (3)$$

Equation 3. Note $CAR[t_0, t_{,1}]$ equals the cumulative abnormal return of index *i* from period of t_0 to t_1

The significance of the cumulative abnormal returns over any event window will be determined by the Students t-statistics as does (Brown & Warner, 1985) with equation (4):

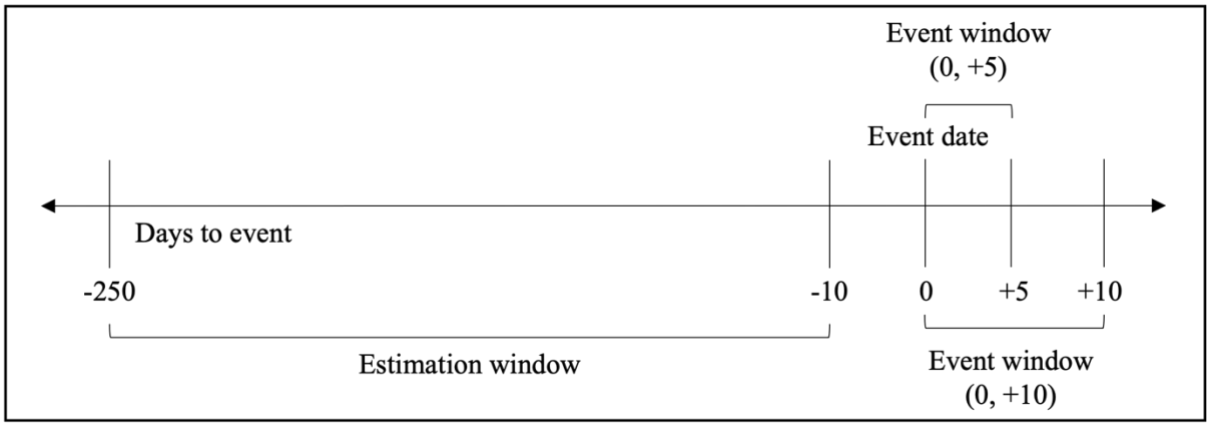
$$t_{CAR} = \frac{CAR_i}{\sqrt{\sigma^2_{CAR_i}}} \quad (4)$$

Equation 4. Note: t_{CAR} equals the Students t-statistics of CAR_i and $\sigma^2_{CAR_i}$ the variance of CAR_i

Event Windows

To study the reactions of the chosen news, I will use two different windows with lengths of 6 and 11 days. Starting from the day of the announcement, I will calculate the market model adjusted CAR of +5 and +10 trading days. (Graph 1) (Liew, 2020) and (Singh et al., 2020) have made similar decisions in their studies exanimating the effects of the pandemic. I calculate the indices' reactions to different events in (0, +5) and (0,+10) days to show the different characteristics of the indices. I believe that some may rebound faster from announcements and others further decline following some trading days after the announcement day. The event windows cannot be longer than this as my goal is to study only short-term reactions and additionally longer event windows would overlap with longer windows. Overlapping is with these event windows is going to happen with the WHO pandemic announcement and ECB's first announcement of PEPP, this will be noted in the results.

As a robustness check for the ECB PEPP announcement dates, I will calculate CAR (-10, +10). I do this to capture the possible calming effect that the stimulus announcements might cause the markets. I want to observe the whole effect that these announcements had, including the turning point. Therefore it is needed to exanimate the market also before the announcements.



Graph 1: The timeline of estimation window, event date, and event windows. Note: this graph shows how the estimation window reaches from 250 to 10 days before the event date. Event windows are (0, +5) and (0, +10) days.

Estimation Windows

The estimation windows for calculating the OLS estimators for each index and each is 240 trading days. The estimation window begins 250 days before the event date and ends 10 days before it, as seen in (Graph 1). This method is suggested by (Brown & Warner, 1985). By not overlapping the estimation windows and event windows, I get parameters that are not influenced by the returns of the event itself. As the goal of the study is finding the possible abnormal returns during the event windows, the window itself could not be used to estimate parameters.

5.3. Limitations

Data

Even if the data (Table 2) used for this study is robust, it has its limitations. All of the industry indices only contain constituents from counties that the MSCI characterizes as developed countries in Europe. The countries in question are Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the UK. This leaves out all of the emerging counties in Europe, a great amount of representation of the European economy. Additionally, some of the industry indices do not have that many constituents, only 25 for InfoTech and Utilities. This creates a bias for company-specific events. Therefore results gained from industry indices need to examined critically. In the case of indices covering large, mid and, small-sized enterprises, these problems however disappear, as all of them are all country (AC) indices and contain both developing and emerging market countries from Europe.

Methodology

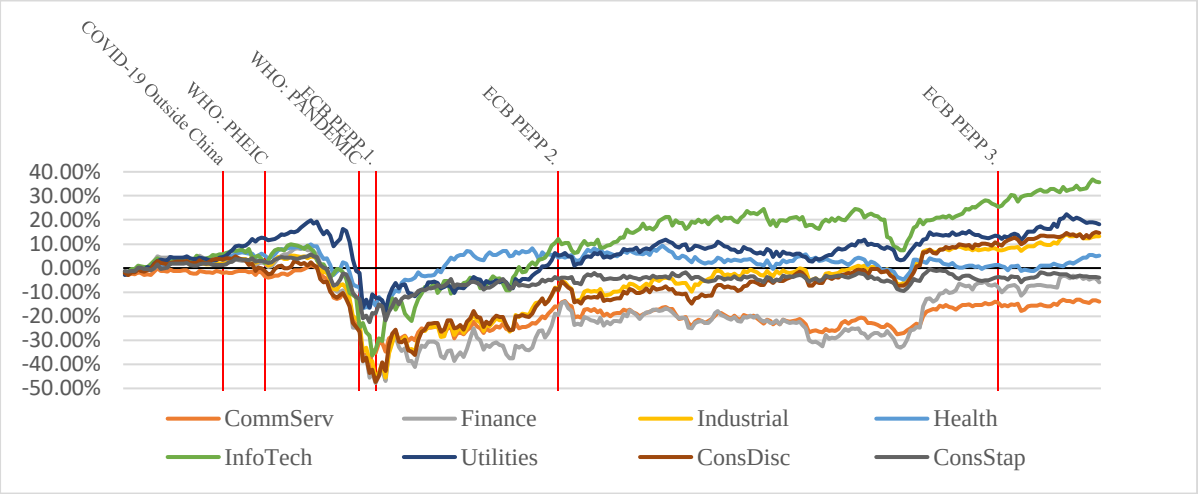
As the OLS estimators are based on historical index performance from 240 trading days before the events, it is important to consider that Covid-19 has largely changed the economic field and situation in the stock markets of Europe. This might cause the estimators to lose accuracy when explaining the

events. In an effort to counter this to some extent, I calculate unique OLS-estimators for all twelve indices and each of the six events. This all adds up to 72 $\hat{\alpha}_i$ and 72 $\hat{\beta}_i$ estimators.

6. *Empirical results*

6.1. Preliminary evidence

The initial reaction of the European stock markets, as seen on Chart 4 and Chart 5 was viciously negative around the time of WHO announced that the epidemic caused by Covid-19 should be classified as a pandemic. Bad news and lowering expectations for the future dragged down markets across industries. In this segment of the thesis, I will go through the stock market reactions around the Covid-19 related bad news dates and the ECB PEPP announcements. As stated previously, the reactions are measured by CAR (0, +5) and CAR (0, +10).



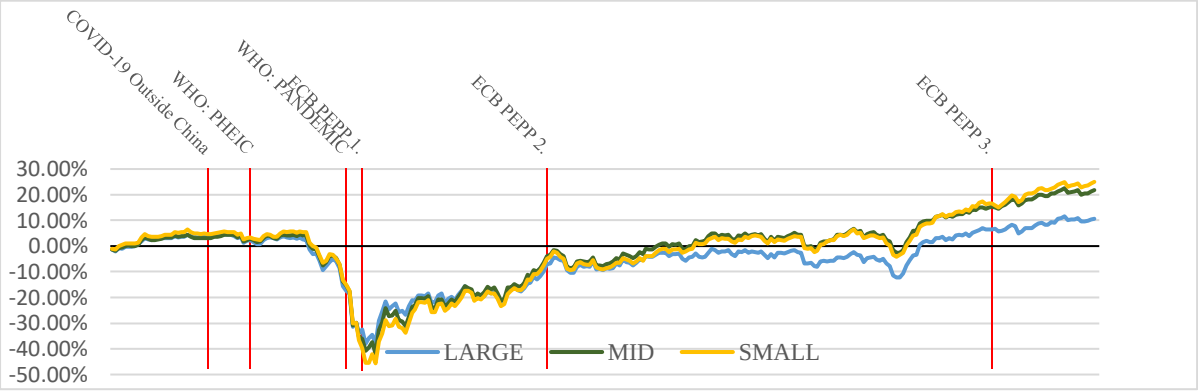


Chart 4 and Chart 5: Industry indices cumulative returns for the year 2020 and size indices cumulative returns for the year 2020. Note: These charts show the cumulative daily returns for the industry indices and size indices during the year 2020. Red vertical lines represent the events, Covid19 outside china, WHO: PHEIC, WHO: Pandemic, ECB PEPP I, II, and III announcements. Cumulative returns of all the indices fall sharply during the WHO pandemic announcement and recover for the rest of the year with some variations across indices.

When looking at the overall performance of different industries (Chart 4) it is clear to say that the reactions differ widely. The indices consisting of companies divided by market capitalization all act in a quite similar fashion for much of the measured time when looking at cumulative returns (Chart 5).

Around the WHO pandemic announcement, all of the indices under observation took a deep dive. Some of the industries, like industrials, communication services, consumer discretionary, and financials dipped further down and took a longer time to regain what was lost. For consumer discretionary, this relates to its characteristics of being very cyclical and dependant on the amount consumed and invested by people and companies. As (Di Maggio et al., 2020) suggested, stock market returns affect people's marginal propensity to consume as much as 23%. Apart from stock market returns effect to affect consumption, (Baker, Farrokhnia, et al., 2020) found out that the pandemic itself seriously cut people's spending in the U.S. Industrials were largely impacted by short-term supply shortages as borders across the world close and partial shutdown of factories during the first Codiv-19 wave (Maarten de Vet et al., 2021). In the financial sector especially banks have been suffering from the pandemic. People and businesses have not had the money available to pay back loans. Also, especially small businesses who do not have access to public capital markets have been drawing down credit lines, to maintain cash buffers during challenging times. This meaning increased funding strains on banks. (International Banker, 2021)

The ECB PEPP announcements, as discussed in the hypotheses have not generated as noticeable spikes in the indices as the pandemic announcement did. Nevertheless, as seen on Chart 4 and Chart 5, there is a rise after the first ECB PEPP date and spike in the indices during the second PEPP announcement. This positive spike is short-lived, but visible and might tell us about the influence that PEPP announcements have had on the markets. After the third PEPP announcement markets have a clear upward slope until the end of the year.

6.2. Bad news events

First COVID-19 case reported outside China
January 13th, 2020

The first event of the study, Covid-19 spreading outside of China for the first time, does not seem to have such a dramatic effect. As seen in Table 3, the news of reporting the event caused statistically significant reactions to the market only for the size indices. MID and SMALL indices seem to be generating small amounts on positive abnormal returns during the CAR (0, +10), window, and LARGE displaying negative CAR in the same time frame. The configuration is flipped upside down when it comes to CAR (0, +5). Nevertheless, any of the size indices results are not statistically significant.

Table 3 *First COVID-19 case reported outside China (January 13th, 2020)*

Index	CAR (0, +10)	t-ratio		CAR (0, +5)	t-ratio	
LARGE	-0,09 %	-0,33		0,10 %	0,50	
MID	0,15 %	0,24		-0,27 %	-0,61	
SMALL	0,66 %	0,81		-0,16 %	-0,27	
CommSer	-0,17 %	-1,08		0,78 %	3,65	***
Finance	1,29 %	7,38	***	1,80 %	7,60	***
Industrial	-1,93 %	-17,24	***	-0,75 %	-4,97	***
Health	-1,15 %	-6,34	***	-1,26 %	-5,11	***
InfoTech	-0,64 %	-6,34	***	-0,33 %	-0,87	
Utilities	-7,08 %	-33,37	***	-3,96 %	-13,77	***
ConsDisc	2,59 %	16,51	***	0,95 %	4,45	***
ConsStap	-2,36 %	-14,11	***	-1,47 %	-6,48	***

Table 3: CAR (0, +10) and CAR (0,+5), COVID-19 outside China. Note: This table shows the CAR for the event windows of the first piece of bad news, the first case of COVID-19 reported outside China, January 13, 2020. T-ratio represents the result for Students t-statistics calculated by equation 4. ***,**, and * represent statistically significant at 1%, 5%, and 10%, respectivel

From the Industry indices, statistically significant negative reactions can be seen by Industrial, Health, InfoTech, Utilities, and a bit surprisingly ConsStap. These reactions are mostly visible in both CAR (0, +10), and CAR (0, +5), Utilities had the biggest decline with -7% of CAR (0, +10), I believe that this reaction relates to the cyclical nature of the utility industry, and the downfall can be explained by declining prices and demand in oil, gas, coal, and electricity in addition to possible company-level factors affecting in this small index. ConsDisc and Financials on the other hand have generated almost positive CAR visible on both time-frames. The reactions of consumer indices are interesting. ConsDisc has made almost 2,6% of positive CAR (0, +10) and ConsStap 2,4% negative CAR in the same time frame. This is against my hypothesis as I was expecting an opposite reaction from these indices in all three bad news events.

From these results, I conclude that the shock of Covid-19 taking its first steps outside of Chinese borders caused some turbulence to certain industries but didn't affect the size indices almost at all. Especially when compared to other events to come, and when making judgements over the CAR displayed by size indices this piece of Covid-19 related news was not that shocking to the markets.

WHO: COVID-19 declared as a Public Health Emergency of International Concern
January 30th, 2020

After just a few weeks from the first event date, the WHO announced that it now treats the Covid-19 epidemic as a Public Health Emergency of International Concern (PHEIC). Table 4 displays the results from this event and the reactions seem to be mostly in line with the results from the previous event. Statistically significant reactions seem to be visible only with the industry indices. Overall, most of the exanimated indices display reactions similar to what can be seen in Table 3. The size indices have the exact same reaction, MID and SMALL are slightly negative, and LARGE is positive, then as the time frame gets expanded to CAR (0,+10), the reaction gets inverted.

Table 4 *WHO: COVID-19 declared as a Public Health Emergency of International Concern (PHEIC) (January 30th, 2020)*

Index	CAR (0, +10)	t-ratio		CAR (0, +5)	t-ratio	
LARGE CAP	-0,09 %	-0,33		0,10 %	0,50	
MID CAP	0,15 %	0,24		-0,27 %	-0,61	
SMALL CAP	0,66 %	0,81		-0,16 %	-0,27	
CommSer	-0,02 %	-0,13		1,95 %	9,19	***
Finance	-4,37 %	-24,90	***	-0,46 %	-1,92	*
Industrial	0,46 %	4,11	***	0,11 %	0,74	
Health	-1,52 %	-8,35	***	0,77 %	3,15	***
InfoTech	-3,82 %	-13,57	***	-2,44 %	-6,42	***
Utilities	-1,13 %	-5,31	***	-0,23 %	-0,80	***
ConsDisc	-0,82 %	-5,20	***	0,36 %	1,67	*
ConsStap	-0,07 %	-0,42		-0,95 %	-4,18	***

Table 4: CAR (0, +10) and CAR (0,+5), WHO: COVID-19 declared as a PHEIC. Note: This table shows the cumulative abnormal for the event windows of the second piece of bad news, WHO announcement of COVID-19 as a Public Health Emergency of International Concern (PHEIC), January 30, 2020. T-ratio represents the result for Students t-statistics calculated by equation 4. ***,**, and * represent statistically significant at 1%, 5%, and 10%, respectively

The reactions of industry indices vary a bit more compared to size. In CAR (0, +10), most of the indices display negative returns with the same indices falling as in the previous event. Although this time, Finance joins the group of declining indices and has taken the deepest hit of – 4,4% CAR (0, +10). The effects that the early steps of the pandemic are now visible in the financial sector. As previously

mentioned, European banks got hit by the pandemic for multiple different reasons. Another major decliner is InfoTech with almost – 4% of CAR (0, +10). Both consumer indices display slightly negative CAR following this WHO announcement.

Overall, it is safe to say that this WHO PHEIC announcement caused quite similar effects to the markets when comparing with the first event. The PHEIC announcement does not seem to have shaken the size indices at all. The industry indices faced a bit more instability following the announcement but effects stayed mostly moderate.

WHO: Covid-19 pandemic announcement
March 11th, 2020

The WHO announcement of classifying the epidemic caused by Covid-19 as a pandemic on March 11th is certainly the most effective of all the events in this study. Table 5 displays huge negative and statistically significant CAR with all of the measured indices. These effects are visible in both size and industry indices and in both time frames.

As the size indices now display statistically significant returns, exanimating them is highly more interesting. The pandemic announcement seems to have resulted in opposite reactions for LARGE compared to MID and SMALL. MID and SMALL both face declines. Abnormal returns of SMALL plummet after the announcement and deepen with the longer time frame, – 7,5 % of CAR (0, +5) and – 8,2% of CAR (0, +10). MID displays the same kind of further declining CAR, only with a more moderate fall. Reaction of LARGE if the complete opposite, + 1,6 % of CAR (0, +5) and +2,2% of CAR (0, +10).

Table 5 *WHO: COVID-19 declared as a Pandemic (March 11th, 2020)*

Index	CAR (0, +10)	t-ratio		CAR (0, +5)	t-ratio	
LARGE	2,24 %	8,05	***	1,63 %	8,20	***
MID	-2,93 %	-2,57	***	-1,15 %	-4,83	***
SMALL	-8,23 %	-12,12	***	-7,33 %	-10,06	***
CommSer	-4,19 %	-26,69	***	-1,73 %	-8,16	***
Finance	-6,01 %	-34,30	***	-0,87 %	-3,65	***
Industrial	-1,33 %	-11,87	***	-1,85 %	-12,17	*
Health	-6,57 %	-36,22	***	-15,12 %	-61,54	***
InfoTech	-11,16 %	-39,68	***	-3,85 %	-10,11	***
Utilities	1,84 %	8,66	***	-1,83 %	-6,37	***
ConsDisc	-9,86 %	-62,77	***	-4,83 %	-22,69	***
ConsStap	-1,97 %	-11,76	***	-5,77 %	-25,43	***

Table 5: CAR (0, +10) and CAR (0,+5), WHO: COVID-19 declared as a Pandemic. Note: This table shows the cumulative abnormal returns for the event windows of the third piece of bad news, WHO announcement of COVID-19 as a Pandemic, March 11, 2020. T-ratio represents the result for Students t-statistics calculated by equation 4. ***,**, and * represent statistically significant at 1%, 5%, and 10%, respectively

These results are also clearly visible in Chart 6 which displays CAR (–10, +10) for size indices. SMALL takes a sharp downfall immediately when the markets open after the announcement on March 12. MID is also facing a decline, although not nearly as sharp as SMALL. LARGE on the other hand takes a move to positive on the day following the announcement. This reaction is in line with (Yan, 2020) findings on the Chinese stock markets, bigger companies do not suffer as much from the pandemic. They have much more market power and stronger supply chains. One thing explaining this reaction can

also be access to capital markets, many medium and small-sized firms rely on bank loans as financing. When all of the economy takes a big hit at once financing only through loans might be troublesome. Smaller companies also have less personnel and positions therefore individual sick leaves and regional restrictions have immense effects. On Chart 6, it can be seen that the decline of SMALL is levelled a bit at five days after the announcement. This relates to the first announcement of ECB PEPP, further discussed in the next chapter.

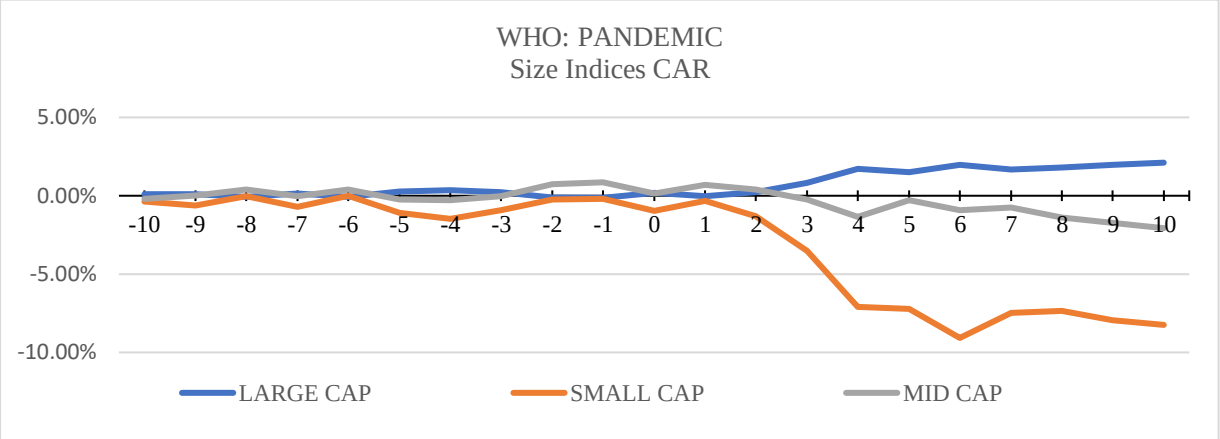


Chart 6: Size indices CAR (–10, +10) during the WHO pandemic announcement. Note: This chart shows the cumulative abnormal 10 days before, and after the WHO Covid-19 pandemic announcement for the size indices. The blue line represents LARGE, grey represents MID and orange represents SMALL. CAR of SMALL falls following the announcement.

Industry indices also took big hits following the pandemic announcement. Every single industry index displayed a negative CAR (0, +5). Health took the deepest dive with –15,2% CAR (0, +5) and –11,2% CAR (0, +10). Even if the industry didn't suffer as much from the pandemic as some other did, this first hit might be explained by the crumbled demand for non-essential medical treatment and generic pharmaceuticals. (Maarten de Vet et al., 2021). Utilities is the only index that displayed any signs of positive returns, +1,84% of CAR (0, +10).

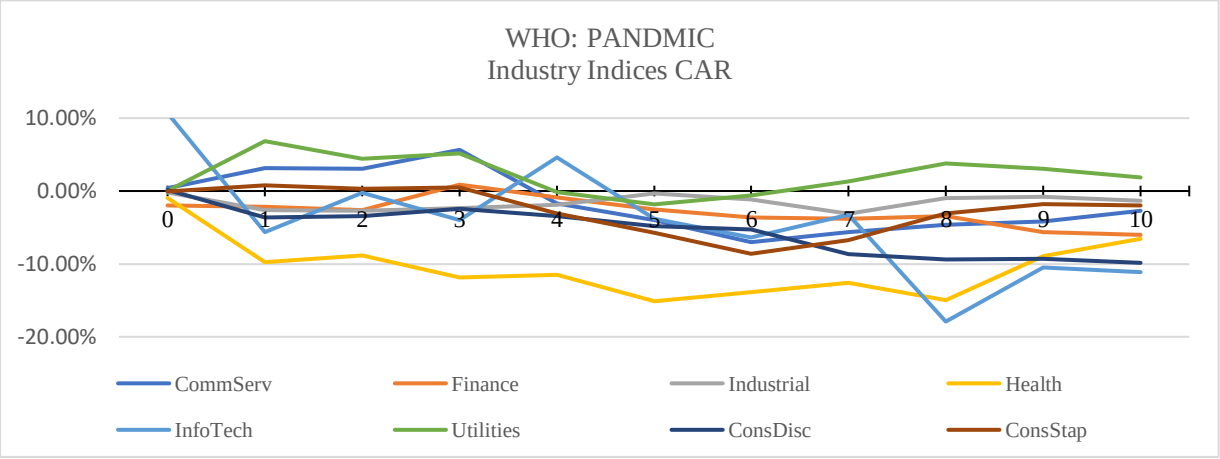


Chart 7: Industry indices CAR (0, +10) during the WHO pandemic announcement. Note: This chart shows the CAR 10 days after the WHO Covid-19 pandemic announcement for the industry indices. Colors representing each index are shown at the bottom of the chart. CAR almost all of the indices fall below zero following the announcement.

Chart 7 reveals that both CommServ and Utilities reacted quite moderately after the announcement and then declined, Utilities soon after returned to positive CAR. Also, highly volatile InfoTech jumps

momentary to positive but stays below zero at the end. begins its dive after the announcement. This time the consumer indices act consistent with my hypothesis, ConsDisc takes a steady downfall following the announcement and ConsStap reacts more moderately. Chart 7 also reveals that after five days, the indices have an upward slope, this relates to the ECB PEPP announcement. This is broaden discussed in the next chapter.

6.3. ECB PEPP announcements

ECB: Pandemic Emergency Purchase Programme, announcement I
March 18th, 2020

The first ECB PEPP announcement took place precisely one week after the WHO pandemic announcement. But because 14.-15.4. was a weekend, there were only five trading days between these event dates. This is why the indices' reactions to the pandemic announcement are greatly affecting the results documented in Table 6, relating to PEPP announcement I. As the market reactions to the pandemic announcement were so dramatically negative, the same pattern can be seen in some indices also this time.

When looking at Table 6, the ECB PEPP does not seem to have an as strong effect on the size indices as the WHO pandemic announcement did. When measured by CAR (0, +5), MID and SMALL are negative and LARGE positive. SMALL turns positive on CAR (0, +10) but the other two are negative. Most of these results are not statistically significant. The robustness check of CAR (–10, +10) provides us with statistically significant returns, but they tell the same story, MID and SMALL are still negative following the pandemic announcement, and LARGE displays the same positive returns as it did in Table 5.

Table 6 *ECB: Pandemic Emergency Purchase Programme, announcement I (March 18th, 2020)*

Index	CAR (-10, +10)	t-ratio		CAR (0, +10)	t-ratio		CAR (0, +5)	t-ratio	
LARGE	1,90 %	4,80	***	-0,04 %	-0,14		0,35 %	1,67	*
MID	-2,54 %	-2,95	***	-0,45 %	-0,71		-0,64 %	-1,40	
SMALL	-6,63 %	-5,62	***	1,03 %	1,20		-1,05 %	-1,66	**
CommSer	2,81 %	1,18		0,95 %	6,04	***	-2,45 %	-11,55	
Finance	4,83 %	1,81	*	3,22 %	18,35	***	-4,80 %	-20,21	***
Industrial	3,33 %	1,96	**	3,70 %	33,03	***	1,03 %	6,78	***
Health	-13,36 %	-4,84	***	5,51 %	30,38	***	4,97 %	20,21	***
InfoTech	-3,18 %	-0,74		-7,18 %	-25,54	***	-15,77 %	-41,44	***
Utilities	11,54 %	3,58	***	4,51 %	21,23	***	1,98 %	6,88	***
ConsDisc	-2,88 %	-1,21		0,97 %	6,18	***	-6,46 %	-30,36	***
ConsStap	-4,34 %	-1,70	*	-2,27 %	-13,54	***	1,14 %	5,01	***

Table 6: CAR (0, +10) and CAR (0,+5), ECB PEPP first announcement. Note: This table shows the cumulative abnormal for the event windows of the first piece of good news, ECB PEPP first announcement, March 18, 2020. T-ratio represents the result for Students t-statistics calculated by equation 4. ***,**, and * represent statistically significant at 1%, 5%, and 10%, respectively

The reaction of the PEPP announcement is more noticeably visible on Chart 8. The sharp fall of SMALL at –4 is caused by the pandemic announcement but after the event day (0) the decline eases and after a few days takes a turn to positive. Even if the SMALL CAR remains negative for all of Chart 8. The impact of ECB PEPP is visible as a calming factor for the index. On Chart 8 it can also be seen that

LARGE barely moves in any direction after the PEPP announcement, staying close to CAR of +2% the whole time. MID on the other hand displays a bit more volatility but still is rather stable around CAR of –2%. PEPP's second goal for stabilising the financial markets seems to be achieved.

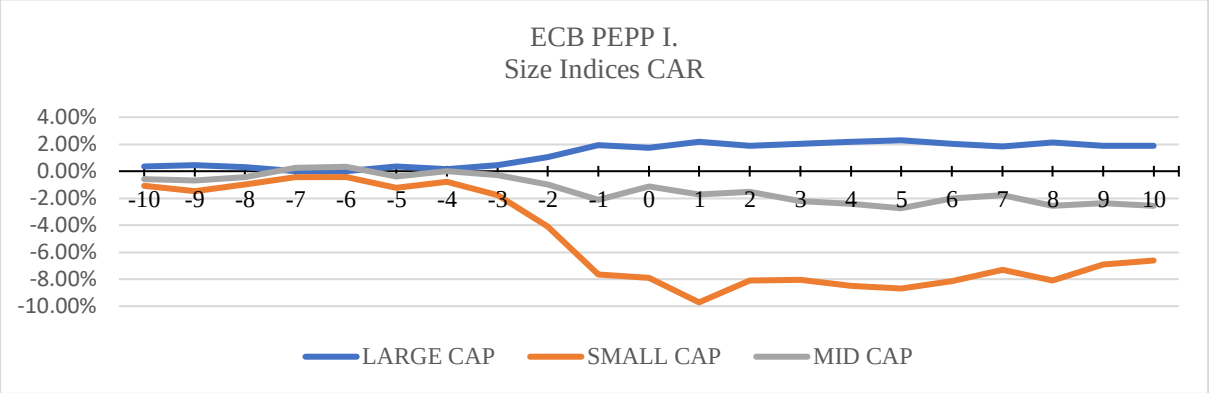


Chart 8: Size indices CAR (–10, +10) during the ECB PEPP I announcement. Note: This chart shows the CAR 10 days before and after the ECB PEPP first announcement for the size indices. The blue line represents LARGE, grey represents MID and orange represents SMALL. The drop of CAR of SMALL ends after the PEPP announcement on day 0.

The effects of the pandemic announcement can also be seen when exanimating the industry indices. In Table 6, many of the industry indices still display negative CAR (0, +5) but turn positive at CAR (0, +10. There are some exceptions, some industries like Health and Utilities are already positive at the shorter time frame, and some, like InfoTech and ConsStap negative still at CAR (0, +10). Similar to the size indices, the reactions of the PEPP announcement are better visible when looking at a chart. Chart 9 showcases that indices Finance, Industrial, and CommServ revolve around CAR 0% on the days following the announcement. Health can be seen to shift directions at the event date and end the decline that began already before the pandemic classification. Overall when comparing the CAR form –10 to 0 and 0 to +10, the latter time series is a bit calmer and upwards sloping, exhibiting the stabilising effect of the PEPP. This is not as visible as on Chart 8, but still noticeable.

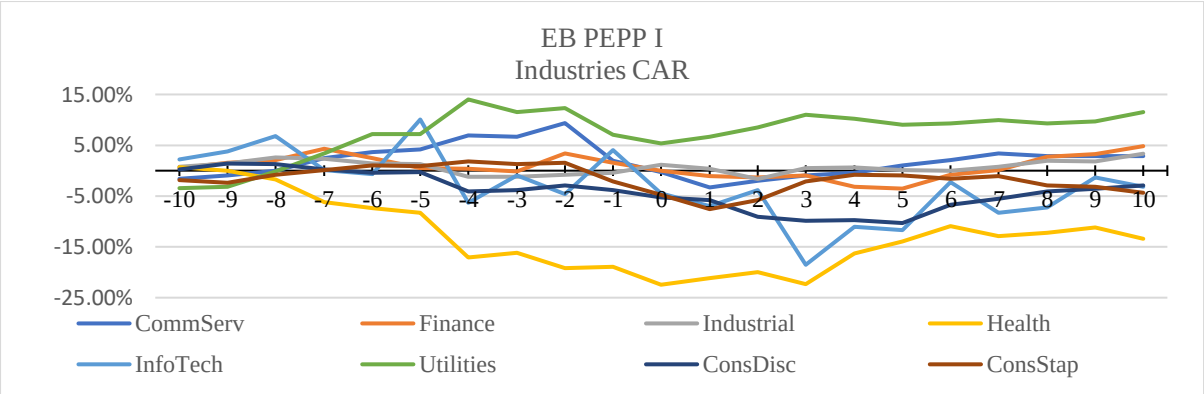


Chart 9: Industry indices CAR (–10, +10) during the ECB PEPP I announcement. Note: This chart shows the CAR 10 days before and after the ECB PEPP first announcement for the industry indices. Colors representing each index are shown at the bottom of the chart. The PEPP announcement at day 0 seems to calm the indices.

ECB: Pandemic Emergency Purchase Programme, announcement II
June 4th, 2020

The second announcement of PEPP, enlarging the stimulus envelope by € 600 billion and pushing its timeline further, does not appear to create as evident reaction in the markets as the first one did.

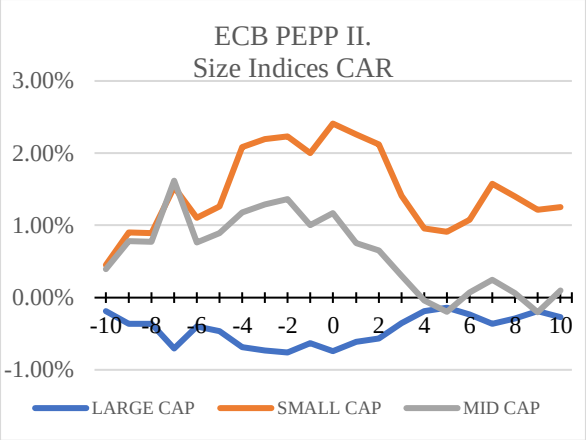
Results presented in Table 7 reveal interesting details about the returns of size indices. When measured by both CAR (0, +5), and CAR (0, +10), MID and SAMLL are showing some decline and LARGE making a small gain. Even if the results are mostly not statistically significant, this reaction is opposite to my hypothesis of ECB PEPP creating positive returns, especially to SMEs. Chart 10 reveals how the size indices CAR has acted. Both MID and SMALL are gaining CAR before the ECB PEPP II announcement and immediately after they begin to drop. This reaction is the opposite of ECB PEPP I and completely out of line with the goal of PEPP. It should be noted though, that this time these CAR movements are noticeably smaller than the ones measured during WHO pandemic announcement or the first ECB PEPP announcement (Chart 6 or Chart 8), and not statistically significant. LARGE seems to be rather stable the whole time and affected only in a minorly positive manner, barely at a detectible level. Overall it is safe to say the second PEPP announcement did not affect the markets like the first one. This might derive from the markets already being in a rather stable growth state after the shocking events of the early months of 2020.

Table 7 *ECB: Pandemic Emergency Purchase Programme, announcement II (June 4th, 2020)*

Index	CAR (-10, +10)	t-ratio		CAR (0, +10)	t-ratio		CAR (0, +5)	t-ratio	
LARGE	-0,27 %	-0,43		0,36 %	0,77		0,49 %	1,43	
MID	0,10 %	0,08		-0,90 %	-1,01		-1,21 %	-1,83	*
SMALL	1,25 %	0,58		-0,75 %	-0,48		-1,09 %	-0,94	
CommSer	-1,77 %	-0,74		0,60 %	3,84	***	2,62 %	12,33	***
Finance	-1,65 %	-0,62		0,96 %	5,50	***	1,27 %	5,36	***
Industrial	0,84 %	0,49		0,47 %	4,20	***	2,59 %	17,09	***
Health	7,06 %	2,56	**	-1,34 %	-7,40	***	0,80 %	3,26	***
InfoTech	-1,82 %	-0,43		-0,83 %	-2,94	***	1,08 %	2,83	***
Utilities	-2,76 %	-0,86		1,67 %	7,86	***	4,04 %	14,07	***
ConsDisc	2,98 %	1,25		2,30 %	14,63	***	2,55 %	12,01	***
ConsStap	1,02 %	0,40		-1,05 %	-6,25	***	0,98 %	4,31	***

Table 7: CAR (0, +10) and CAR (0,+5), ECB PEPP second announcement. Note: This table shows the cumulative abnormal for the event windows of the second piece of good news, ECB PEPP second announcement, June 4, 2020. T-ratio represents the result for Students t-statistics calculated by equation 4. ***,**, and * represent statistically significant at 1%, 5%, and 10%, respectively

Table 7 reveals that all of the industry indices have positive CAR (0,+5). With the longer time-frame of CAR (0, +10) the positive returns seem to fade away. Every index either displays a smaller positive or even negative CAR in this interval. It seems as the second PEPP announcement gave a short-lived boost to the industry indices. This boost was truly only momentary, half of the CAR (–10, +10) results show negative returns, even if not statistically significant. Chart 11, reveals that the gains of indices displaying positive CAR (–10, +10) like Health, ConsDisc and, Industrial seem to start already way before the event. The announcement itself does not seem to have any particularly noticeable effect on the indices.



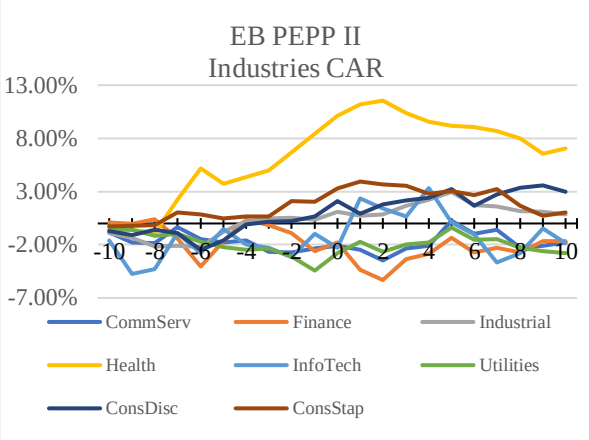


Chart 10 & Chart 11: Size indices CAR (–10, +10) and Industry indices CAR (–10, +10) during the ECB PEPP II announcement. Note: These charts show the CAR 10 days before and after the ECB PEPP second announcement for the size indices and industry indices. In Chart 10, the Blue line represents LARGE, grey represents MID and orange represents SMALL. In Chart 11, Colors representing each index are shown at the bottom of the chart. The PEPP announcement at day 0 seems to lower the CAR of SMALL and MID, the size indices do not seem to react noticeably.

ECB: Pandemic Emergency Purchase Programme, announcement III

December 10th, 2020

The last event of this study, the ECP PEPP announcement III added €500 billion to the stimulus envelope. This announcement delivers more promising results than the second announcement of ECB PEPP. Table 8 reveals that MID and SMALL seem to have benefitted from the stimulus announcement. LARGE on the other hand dropped after the announcement. These outcomes can be seen on both CAR (0, +5) and CAR (0, +10). These results are more clearly visible on Chart 12, where it can be seen that the third PEPP announcement causes the markets to lift small- and medium-sized companies at the expense of large ones. This time the reactions are more noticeable compared to the second PEPP announcement. When it comes to PEPP's goal of stabilising the financial markets, this announcement seems to transfer funds from LARGE to SMALL and MID. Again, it is noteworthy that these results are not statistically significant, and this effect does not cause nearly as large movements as did the pandemic announcement or the first ECB PEPP announcement.

Table 8 *ECB: Pandemic Emergency Purchase Programme, announcement III (December 10th, 2020)*

Index	CAR (-10, +10)	t-ratio		CAR (0, +10)	t-ratio		CAR (0, +5)	t-ratio	
LARGE	-0,88 %	-1,27		-0,73 %	-1,45		-0,32 %	-0,86	
MID	1,23 %	0,91		1,08 %	1,10		0,46 %	0,63	
SMALL	2,82 %	1,22		2,26 %	1,34		1,01 %	0,82	
CommSer	2,48 %	1,04		2,46 %	15,68	***	2,75 %	12,93	***
Finance	4,51 %	1,69	*	1,86 %	10,58	***	2,63 %	11,08	***
Industrial	4,52 %	2,65	***	1,11 %	9,94	***	2,23 %	14,73	***
Health	4,98 %	1,81	*	3,88 %	21,36	***	2,24 %	9,10	***
InfoTech	-2,45 %	-0,57		-2,04 %	-7,27	***	-1,16 %	-3,05	***
Utilities	3,66 %	1,13		0,00 %	-0,01		0,78 %	2,72	***
ConsDisc	2,55 %	1,07		0,48 %	3,08	***	0,70 %	3,29	***
ConsStap	3,07 %	1,21		1,07 %	6,38	***	1,00 %	4,40	***

Table 8: CAR (0, +10) and CAR (0,+5), ECB PEPP third announcement. Note: This table shows the cumulative abnormal for the event windows of the third piece of good news, ECB PEPP third announcement, December 10, 2020. T-ratio represents the result for Students t-statistics calculated by equation 4. ***,**, and * represent statistically significant at 1%, 5%, and 10%, respectively

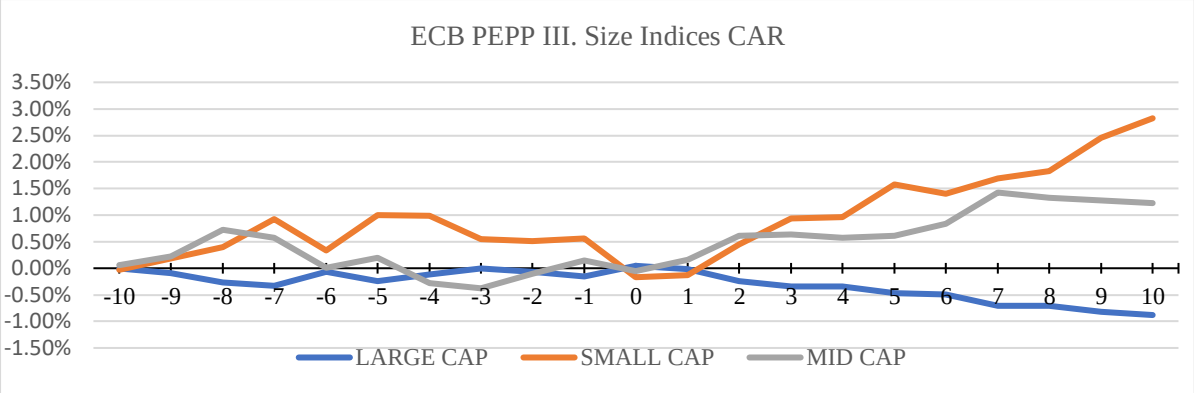


Chart 12: Size indices CAR (–10, +10) during the ECB PEPP III announcement. Note: This chart shows the CAR 10 days prior and after the ECB PEPP third announcement for the size indices. The blue line represents LARGE, grey represents MID and orange represents SMALL. Following the announcement at day 0, CAR of SMALL and MID rise sharply, CAR of LARGE falls.

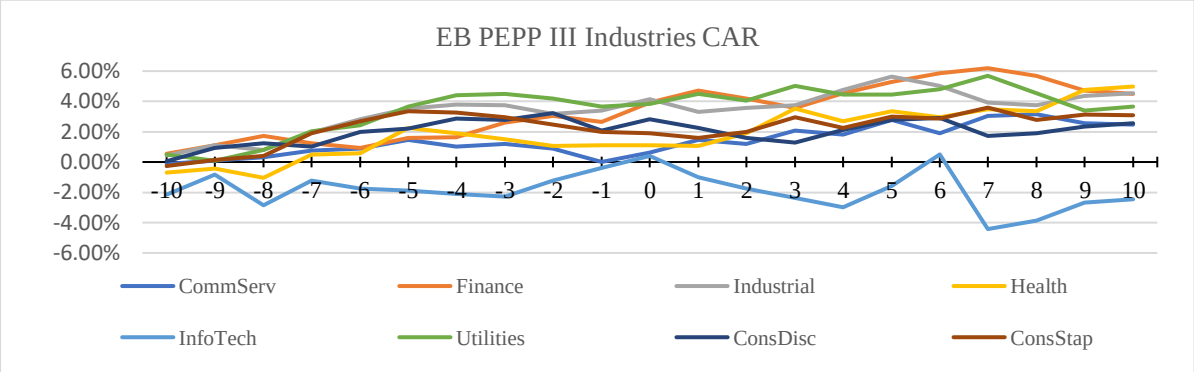


Chart 13: Industry indices CAR (–10, +10) during the ECB PEPP III announcement. Note: This chart shows the CAR 10 days prior and after the ECB PEPP third announcement for the industry indices. Colors representing each index are shown at the bottom of the chart. The CAR of all the indices seems to be steadily rising throughout the event window.

The reactions of the industry indices seem to be mostly in line with the previous ECB PEPP announcement. All of the industry indices apart from InfoTech have positive CAR (0,+5). This time, the CAR (0, +10) does not have as unanimous effect, Health is the biggest gainer and InfoTech has negative abnormal returns (Table 8). Finance, industrial, and Utilities are among the top gainers and when measured by CAR (–10, +10). Their abnormal results start adding up already before the announcements, even if the results do not display statistical significance. Overall, the general reaction to this announcement is positive. Chart 13 reveals how the AR slowly cumulates during the (–10, +10) timeline. The ECB PEPP announcement rises the indices CAR, but the rising trend exists already before it.

7. Discussion

From the empirical results of the study I can conclude that all of the events did not cause equally strong reactions to the markets. The pandemic declaration seemed to be the most effective, creating huge negative abnormal returns. The first ECB PEPP announcements helped the markets to cope with pandemic losses, the second was not that effective and the last one seemed to give a boost especially to SMEs.

It is safe to say that the first event under analysis, Covid-19 spreading outside China, did not have that serious effect. The same goes for the next event, WHO announcing the epidemic a PHEIC. In both events, the markets exhibited quite moderate responses. During the latter one, the stock market reaction was a bit stronger compared to the previous one. These events caused statistically significant CAR only in industry indices, affecting especially Utilities, InfoTech, and Finance. I deem that it is evident that my hypothesis about the pandemic declaration being the most effective piece of news has been correct.

During the time of the pandemic announcement, all of the indices chosen for this study displayed statistically significant, negative CAR (0, +5) and CAR (0, +10). From the size indices, especially CAR of SMALL was very negative. An interesting result during this event was that LARGE showed positive abnormal returns following the announcement. This effect is consistent with (Yan, 2020) findings on the Chinese stock markets, where large companies benefit from large supply chains and monopoly-like power, the European large companies seem to act similarly. It was also interesting to see how Health and Infotech resulted in such huge losses during the time. Even if I thought that they might take a hit, the dive was deeper than expected.

As previously brought up, the ECB PEPP announcements were not equal in terms of affecting the markets. The first of the three had the most substantial effect. Effects of the pandemic announcement are still visible in this event, the WHO announcement caused the markets to plummet only five trading days before the PEPP publication. For many of the indices, the first piece of stimulus news ended the fall and stabilized the abnormal returns. This is most noticeably visible on Chart 8. Even if the size indices CAR are mostly not statistically significant, the calming effect is particularly visible in small-cap firms. Abnormal returns of many of the industry indices that had been struck following the pandemic announcement also shifted directions after the PEPP announcement.

The second PEPP date did not appear to be as significant to the markets and lacks a cohesive effect on the indices under revision. Size indices did not display statistically significant CAR, but Chart 10 showcases the decline of SME CAR and a slight rise of large companies CAR. This effect is against my hypothesis, as I expected SMEs to gain more than large during the ECB PEPP announcements. For the industry indices, the announcement created short-lived positive abnormal returns.

Finally, the third PEPP announcement seemed to have much more effect. The abnormal returns of small- and medium-sized companies grew noticeably after the announcement, best visible on Chart 12. Large companies on the other hand did not seem to benefit from the announcement and abnormal returns sifted slightly negative following the PEPP publication. This, however, was not statistically significant. Out of the industry indices, all but one displayed statistically significant CAR. Interestingly, the index with negative CAR is InfoTech, which I believed to be one of the top performers.

Overall, the results are quite well in line with my hypothesis. The WHO pandemic announcement created the most furious reactions. The ECB PEPP dates seemed to generate positive abnormal returns in the indices, and they did not cause as big reactions as the pandemic announcement did. SME reacted often more furiously than large companies did. However, the reactions of certain industries, like consumer indices were not in line with my predictions with all of the event dates.

Generally, in my opinion the size indices revealed more about the state of the markets and effectiveness of both the Covid-19 related news and ECB PEPP announcements than the individual industry indices did. The size indices provide a look throughout the economy and uncover the results without the effects of individual industries and even company-level events that might have been disturbing the results for some of the industry indices with the least constituents. This said the industry indices do provide the

needed depth to properly analyse the reactions that the different events had. In many cases, the CAR of industry indices were statistically significant when size indices CAR were not.

8. Conclusions

The objective in this study was to examine the European stock market reactions to three pieces of bad news and, three announcements of ECB PEPP. To sum up everything that has been discussed so far, the results suggest that the news from the pandemic and ECB PEPP announcements under examination have affected the markets. Out of the bad news, the pandemic announcement was the most significant by far. It created huge negative abnormal returns for almost all the indices in the study. Out of the ECB PEPP announcements, especially the first and the third announcements seemed to affect the markets. SMEs reacted more positively to the PEPP announcements compared to large companies.

Based on my literature review and the results of this study, I suggest that future studies conducted from the area could focus on the reactions, that other events related to the pandemic have caused to the stock markets. These events could include the presentation of vaccinations and different virus variants. Once the pandemic is over, one area of particularly interesting topic of research would be the rise from the Covid-19 recession. Additional areas of future research could contain industry-specific studies, and studies focusing on the mid- and long-term effects of the PEPP, on both the stock markets and the real economy.

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